CSE455/CSE552 – Machine Learning (Spring 2023)

Homework #4

Hand-in Policy: Via Teams. No late submissions will be accepted.
Collaboration Policy: No collaboration is permitted.
Grading: This homework will be graded on the scale 100.

Description: The aim of this homework is to explore using neural networks as base classifiers for AdaBoost learning.

Part I: Select a dataset

Select a data set to be used to show your problem. You can choose something from the UCI repository.

Part II: Train a multi-layer perceptron

You should experiment with at least 3 different depths and different number of nodes in each. Report performance of your algorithm.

Part III: Train a multi-layer perceptron

Use a one-hidden-layer perceptron as your base classifier to train an AdaBoost ensemble learner. Report performance of your trained algorithm.

Part IV: Train a random decision forest where each decision in the forest is in turn is a trainable perceptron.

This time instead of using a comparison decision at each node, train a perceptron for each node to make the best decision for the given data reaching to this node. Report your results.

Note that sometimes you may not have enough data reaching a given node to train the neural network. You can try different techniques including:

1. Use a trained network from earlier nodes (ancestors) as a base an refine it with the given data for a few iterations.
2. Stop growing the tree for this node.

What to hand in: You are expected to hand in one of the following

HW5_lastname_firstname_studentnumber_code.ipynb. Your notebook should have:

Part I: Code

Results:

Conclusions:

Part II: Code

Results:

Conclusions:

Part III: Code

Results:

Conclusions:

Part IV: Code

Results:

Conclusions: